REMARKS

Summary

This Amendment is responsive to the Office Action mailed on April 27, 2005. Claims 1, 3, and 22 are amended herein. Claims 1-23 are pending.

The Examiner has indicated that claims 5, 6, 9-11, 20 and 21 contain allowable subject matter.

Claims 1-4, 7-8, 12-14, 18-19, and 22-23 stand rejected under 35 U.S.C. § 102(e) as being anticipated by Cox (US 6,154,571).

Claims 15-17 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Cox in view of Oami (US 6,665,419).

Applicants respectfully traverse these rejections in view of the amended claims and the following comments.

Discussion of Amended Claims

Claims 1 and 22 are amended to specify that the deterioration of the embedded watermark is based on recovered data bits from a plurality of the redundantly embedded watermarks (see, e.g., Applicants' specification, page 14, lines 10-23).

Claim 3 is amended to delete a portion of the claimed subject matter.

Discussion of Cox

The Examiner has rejected claims 1-4, 7-8, 12-14, 18-19, and 22-23 as being anticipated by Cox. This rejection is respectfully traversed. An anticipation rejection requires that each and every element of the claimed invention as set forth in the claim be provided in the cited reference. See *Akamai Technologies Inc. v. Cable & Wireless Internet Services Inc.*, 68 USPQ2d 1186 (CA FC 2003), and cases cited therein. As discussed in detail below, Cox does not meet the requirements for an anticipation rejection.

Cox discloses a watermarking procedure designed to reduce the degradation of embedded watermarks that undergo MPEG-2 encoding (Col. 9, lines 50-52).

In rejecting claims 1 and 22, the Examiner indicates that: "*Cox discloses*

embedding a watermark with a degree of redundancy into the signal to form a steganographic signal in (fig. 1). Cox disclose measuring a deterioration of the embedded watermark in the steganographic signal after the steganographic signal undergoes the processing and estimating the nature and or the amount of the processing based on the measured deterioration in (fig. 3 and col. 9, lines 50-63 and col. 11, lines 18-42)" (Office Action, page 2).

The section of Cox relied on by the examiner (Fig. 3 and Col. 9, lines 50-63) describes a specialized MPEG-2 encoder that is modified to reduce the degradation of watermarks if the content that carries the watermark were to be compressed with MPEG-2 compression scheme: "Fig. 3 is a schematic diagram of a modified MPEG-2 encoder for reducing degradation of a watermark in watermarked data." (Col. 9, lines 50-53). Specifically, Figure 3 shows the modified watermark insertion mechanism for MPEG-2 encoded Predicted pictures (i.e., P-frames) (Col. 9, lines 28-29). Cox further indicates that this reduction of watermark degradation is accomplished by modifying the watermark information, from the way in which the watermarks would normally be embedded, in order to make the watermarks suitable for MPEG-2 compression: "In addition, in this embodiment, watermark information is modified in order to be suited to MPEG-2 compression." (Col. 9, lines 60-63).

In order to modify the watermarks for MPEG-2 compression, DCT coefficients which correspond to the images which are expected to be generated in a decoder are input into a watermark correction device 62. The watermark correction device 62 outputs watermark correction signals, which are added to the quantization values from quantizer 36 at adder 64. The output of adder 64 is used as the input to the variable length encoder 38 and inverse quantizer 40 (Col. 9, line 63 through Col. 10, line 8).

Accordingly, Cox attempts to compensate for degradation of a watermark due to MPEG-2 encoding by modifying the watermark during the encoding of the signal carrying the watermark. In contrast, Applicants' claims 1 and 22 provide for estimating the nature and/or amount of processing that is applied to a signal, which is embedded with watermarks, by specifically measuring the deterioration of embedded watermarks. With the present invention, the watermark to be carried in the signal are not modified in

any way before the processing in an attempt to reduce the degradation of the watermarks or make them more robust to MPEG-2 compression. In fact, with the present invention, watermarks are embedded with a degree of redundancy and the deterioration of embedded watermarks is the basis for estimating the nature and/or amount of processing. For example, the watermark information (e.g., represented by a plurality of data bits) may be repeated hundreds of times. Even if a high percentage of these data bits may be destroyed through processing of the signal, it is still possible to reliably recover data bits making up the watermark from the processed signal, due to the high degree of redundancy of the data bits in the original signal due to the redundant embedding of the watermark. Once the data bits of the original watermark are recovered, the estimation of the processing can be made based on the percentage of incorrect bits in the raw data stream comprising the watermark and deriving a bit-error-rate measurement (BER) therefrom (see, e.g., Applicants' specification, page 14, lines 10-23). In contrast, in the sections of Cox relied on by the examiner, the steganographic signal is subjected to a known process, namely MPEG-2 compression and embedded watermarks are modified to reduce their degradation when subject to MPEG-2 processing.

Also, in Cox, as disclosed in Fig. 3 and related portions of the specification, the effects of MPEG-2 compression on embedded watermarks is discerned by requiring the presence of the watermarked signal before any such compression (i.e., in Fig. 3, the signal going into the IDCT 54) as well as the signal after it undergoes MPEG-2 compression/decompression (i.e., in Fig. 3, the signal coming out of Frame Memory 32 and entering subtraction box 30). In claim 1 of the present invention, a deterioration of embedded watermarks is measured after the signal undergoes processing. With Applicants' claimed invention, there is no need to have knowledge of the embedded signal before it undergoes processing in order to estimate the amount or nature of the processing.

Also, in claim 1 of the present invention, the watermarks are embedded redundantly in the content and the measurement of the deterioration of the redundantly embedded watermarks are used to estimate the nature and/or amount of the processing. The deterioration of the embedded watermark is based on recovered data bits from a

plurality of said redundantly embedded watermarks. In Cox, the effects of MPEG compression is determined for each individually embedded watermark and each embedded watermark is modified to improve its resiliency to the MPEG compression processing.

Therefore, Cox does not disclose or remotely suggest measuring a deterioration of the embedded watermark in the steganographic signal after the steganographic signal undergoes the processing, said deterioration of the embedded watermark being based on recovered data bits from a plurality of said redundantly embedded watermarks, and estimating the nature and/or the amount of the processing based on the measured deterioration, as set forth in Applicants' amended claims 1 and 22.

In rejecting claim 2, the Examiner indicates that "*Cox disclose estimates an intrinsic fragility of the watermark by analyzing characteristics of the steganographic signal in (col. 10, lines 21-58)*" (Office Action, page 2).

Column 10, lines 21-58 of Cox, as best understood, describes calculating watermark correction values for Predicted pictures in an MPEG-2 encoding process and adding them to the MPEG-2 compressed images. This section of Cox does not disclose or remotely suggest estimating an intrinsic fragility of the watermark by analyzing characteristics of the steganographic signal, as set forth in Applicants claim 2. The intrinsic "fragility" of a watermark indicates how easily a watermark will be degraded (see, e.g., Applicants' specification, page 18, lines 1-13). Rather, Cox uses known parameters of the signal (e.g., quantization values, DCT coefficients, etc.) to calculate a watermark correction value.

Cox does not disclose or remotely suggest that the estimating of the amount and/or nature of the deterioration comprises estimating an intrinsic fragility of the watermark by analyzing characteristics of the steganographic signal, as set forth in Applicants' claim 2.

In rejecting claim 3, the Examiner indicates that: "*Cox disclose controlling an output of the steganographic signal when the amount of the estimated processing exceeds a threshold level, or the nature of the estimated processing is of a specified type in (col. 10, lines 48-58)*" (Office Action, page 2).

Column 10, lines 48-58 of Cox describes generating the watermark correction signals based on the absolute value of 'Dif' and sign of 's'. There is no disclosure or suggestion in Cox of controlling the output of the steganographic signal when the estimated processing exceeds a threshold value, as set forth in Applicants' amended claim 3.

In rejecting claim 4, the Examiner indicates that: "*Cox disclose the nature and or the amount of the estimated processing indicates whether the steganographic signal has undergone unauthorized processing in (col. 9, lines 7-26)*" (Office Action, page 3).

The portions of Cox relied on by the Examiner describes how the invention achieves a balance between providing a perceptually acceptable embedded image and the maximum allowable probability of missed watermark detections after any predefined set of attacks. Specifically, in Cox, the image is watermarked and subjected to simulations of attacks; if the image fails to meet the maximum allowable probability of missed detections, the user is instructed to make a decision as to whether to improve the robustness of detections by decreasing the fidelity of the image or accepting the level of missed probability of detections (Col. 9, lines 12-19). Cox does not disclose or remotely suggest that the nature or amount of processing is estimated based on measured deterioration of embedded watermarks and such estimation indicates whether the steganographic signal has undergone unauthorized processing, as is set forth in Applicants' claim 4.

In rejecting claim 7, the Examiner indicates that: "*Cox discloses perceptual compression and decompression in (col. 4, lines 35- 37)*" (Office Action, page 3).

Cox does not disclose or remotely suggest that the measurement of the deterioration of watermarks provides estimates of the amount and/or nature of perceptual compression and decompression. At best, Cox discloses adjusting the embedded watermark values to withstand MPEG-2 compression. This concept used in Cox is different from estimating the nature and/or amount of perceptual compression and perceptual decompression based on measuring the deterioration of redundantly embedded watermarks.

In rejecting claim 8, the Examiner indicates that: "*Cox discloses deterioration of*

the embedded watermark is measured in accordance with a fragility profile of the embedded watermark in (col. 8, lines 10-16; col. 11, lines 30-45)" (Office Action, page 3).

Column 8, lines 10-16 of Cox describes breaking an image into 3 groups of DCT terms and embedding each group as though it were a separate image. This way the watermark from at least one group will generally survive the specific attack of cropping 24 columns of pixels from the left side and 24 columns of pixels from the right side of the image. Column 11, lines 30-45 of Cox describes a modified MPEG-2 encoder for Predicted pictures shown in Figure 4, where embedded watermarks are modified to reduce their degradation if they undergo MPEG-2 encoding. There is simply no disclosure or suggestion in Cox that a deterioration of an embedded watermark is measured in accordance with a fragility profile of the embedded watermark, as set forth in Applicants' claim 8.

The Examiner has rejected claim 13, indicating that: "*Cox disclose analyzing an intrinsic fragility of the signal, which is a carrier of the watermark layer and determining a fragility profile in response to analyzing step in (col. 10, lines 21-58). Cox discloses wherein fragility profile is a model or a function that relates a degradation measure of the watermark layer to a degradation measure of the signal that carries the watermark in (col. 10, lines 19-47)*" (Office Action, page 3).

In Column 10 lines 19-58, Cox discloses embedding the watermarks in an image, compressing the image with an MPEG-2 encoder and calculating a watermark correction value and adding it to the MPEG-2 compressed image. There are no teachings that describe analyzing intrinsic fragility of the signal, which is the carrier of the watermark layer. In contrast, Cox discloses "This Dif value corresponds to the distortion of the watermark inserted at the adder 52 ..." (Col. 10, lines 45-46). Furthermore, there are no teachings in Cox that indicate determining a fragility profile that relates the degradation measure of the watermark layer to a degradation measure of the signal that carries the watermark.

Also, in Cox's disclosure, there is a need for the presence of the watermarked content both before and after the content undergoes MPEG-2 compression. In Applicants'

claim 13, there is no need for the presence of watermarked content before and after processing. In fact, in claim 13 of the present invention, there is no requirement for the actual embedding to take place as the signal which is a carrier of the watermark layer is analyzed in order to determine a fragility profile.

Cox does not disclose or remotely suggest determining a fragility profile which is a model or function that relates a degradation measure of the watermark layer to a degradation measure of the signal that carries the watermark, as set forth in Applicants' claims 13 and 23.

In rejecting claim 18, the Examiner indicates that: "*Cox disclose after the analyzing and determining steps, the signal, and data designating the fragility profile are distributed to a decoder in (fig. 10)*" (Office Action, page 3).

Figure 10 of Cox illustrates a system for detection of watermarks in the presence of translations in embedded images. The procedure involves finding the offset value due to the translation and compensating for the offset to enable detection of watermarks. Cox does not disclose or remotely suggest distributing data designating a fragility profile to the decoder, as set forth in Applicants' claim 18.

In rejecting claim 19, the Examiner indicates that: "*Cox discloses data designating the fragility profile is carried in the signal in (fig. 3.)*" (Office Action, page 3).

Figure 3 of Cox discloses embedding the watermarks in an image, compressing the image with an MPEG-2 encoder and calculating a watermark correction value and adding it to the MPEG-2 compressed image. As discussed above, Cox does not disclose or remotely suggest determining a fragility profile. Furthermore, there are no teachings to indicate the data that designates a fragility profile is carried in the signal. In Cox, the corrections to the watermarks are added to the compressed MPEG-2 signals to produce an embedded content with watermarks that are more immune to MPEG-2 compression.

As Cox does not disclose each and every element of the invention as claimed, the rejections under 35 U.S.C. § 102(e) are believed to be improper, and withdrawal of the rejections is respectfully requested. See, *Akamai Technologies Inc., supra.*

In view of the above, Applicants respectfully submit that the present invention would not have been obvious to one skilled in the art in view of Cox, taken alone or in combination with Oami, or any of the other prior art of record.

Further remarks regarding the asserted relationship between Applicants' claims and the prior art are not deemed necessary, in view of the amended claims and the foregoing discussion. Applicants' silence as to any of the Examiner's comments is not indicative of an acquiescence to the stated grounds of rejection.

Withdrawal of the rejections under 35 U.S.C. § 102(e) and 35 U.S.C. § 103(a) is therefore respectfully requested.

Conclusion

The Examiner is respectfully requested to reconsider this application, allow each of the pending claims and to pass this application on to an early issue. If there are any remaining issues that need to be addressed in order to place this application into condition for allowance, the Examiner is requested to telephone Applicants' undersigned attorney.

Respectfully submitted,

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ATTORNEY DOCKET NO.: SOL-148
Date: June 9, 2005